

## **B-9** Making Sense of Summary Statistics & Probability: It's the Variable That Matters! (Gr. 5-6)



### **RICHARD DUNNE**

Richard has taught math to a broad spectrum of ages in a variety of schools in the UK. He developed *Maths Makes Sense*, a popular math program for primary schools. As an educational consultant and trainer, he focuses on curriculum design that enables everyone to become confident mathematicians.

### **PUBLISHED WORKS:**

#### **Teacher Resources:**


*Maths Makes Sense*

All resource materials not specifically identified as being reprinted from another source is copyright © 2011 by Richard Dunne.  
You may not distribute, copy, or otherwise reproduce any of this material for sale or for commercial use without written permission from the author.

### **Bring SDE presenters to your school!**


SDE can bring customized training directly to your school.  
For more information call SDE's Professional Development Specialists at  
**1-877-388-2054** or visit **[www.SDE.com/onsitetraining](http://www.SDE.com/onsitetraining)**

## **Making Sense of Summary Statistics & Probability: It's the Variable That Matters! (Gr. 5-6) (A4 – Pre-Req) *Richard Dunne***



Introduce your students to summary statistics and probability using everyday objects. You'll discover simple, hands-on methods for calculating mean, median, mode, and ratio and for confidently using the concept of the variable. You'll reinforce your students' understanding and boost their math confidence. Plus, you'll gain specific strategies you can use to help all your budding statisticians make sense of the math vocabulary.

The 'statistics' of mean, median, mode and range are often taught in terms of the calculations or methods that generate them, but the purpose and meaning of them are sometimes omitted. Of course, when older students engage with mathematical statistics (including sampling and 'standard deviation') there is a need for considerable detail which, even with careful teaching, often seems confusing.



It is in the work with older students that the Big Idea 'the symbols speak to you' is of crucial importance (there is a message in, for instance, a 'mean' written with the symbol " $\bar{x}$ " - an  $x$  with a line above it) and a mean written with the symbol " $\mu$ " (a Greek letter), but details of that nature are not necessary when younger *children* are introduced to 'statistics'.

However, a central principle of *Maths Make Sense* (and this is a feature of the design of all its teaching) is:

Anything that comes earlier should anticipate that comes later, and what comes later should be assisted by the earlier learning

It is for this reason that *Maths Makes Sense* introduces the distinction between 'Descriptive statistics' and 'Summary statistics', together with reference to a 'sample'. A formal distinction between a population and a sample is not made until students study statistics more rigorously, but the symbols we use are related to a 'sample' and it is made clear that a 'sample' consists of values of a 'variable'. This anticipates the later need to define a 'population' as a list of values of a variable rather than the everyday use of the geographical idea of a population as 'people'.

Equally, it is necessary to give younger children some idea of the meaning and purpose of 'summary statistics', and I will show how *Maths Makes Sense* introduces this. This is illustrated by the introduction of the 'mean', leading to the use of the formal calculation which is introduced logically (capitalizing on the manner in which children learn 'division').

Similarly, 'probability' is introduced with careful attention to the vocabulary of 'incident / trial / event', together with 'outcome' and 'equally likely outcomes'. But there two vital aspects of this teaching:

'Probability' is defined in relation to the Big Idea of 'ratio' (as 'comparison').

An 'event' is given special attention. It is a term used in the 'subjunctive mood'.

I will elaborate on these notes during the session.

Incidentally, when we teach older students the meaning and method of 'standard deviation, it is the Big Idea of ratio ('comparison') that is a key feature of the teaching, which is one reason for *Maths Makes Sense* introducing 'ratio' early and carefully.

Arievitch, I (1988) *From Vygotsky to Galperin: Development of an idea of a mental act's "outsiderness"*. IV Cheiron Conference, Budapest. September 1988

Bruner, J. (1966) *Toward a theory of instruction* New York: W.W. Norton & Company

Bruner, (1996) *The culture of education* Cambridge, Mass: Harvard University Press

Bruner, ( 1986) *Actual minds, possible worlds* Cambridge, Mass: Harvard University Press

Bruner, J. (1970) *Man: A Course of Study: Seminars for Teachers*. Cambridge: Mass. Education Development Center.

Bruner, J. (1970) *Man: A Course of Study: Talks to Teachers*. Cambridge, Mass. Education Development Center.

Feldman, C.F. (1987) Thought from Language: the linguistic construction of cognitive representations, pp. 131-146. In, Bruner, J & Haste, H. (1987), *Making Sense*. London and New York: Methuen.

Haenen, J. (1996) *Piotr Gal'perin: Psychologist in Vygotsky's Footsteps*. New York: Nova Science Publishers, Inc.

Nesher, P. (1989) Microworlds in Mathematical Education. In, Resnick, L.B. (ed) (1989) *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*, pp. 187-215. Hillsdale, New Jersey: Lawrence Earlbaum Associates.

Koestler, A. (1964) *The Act of Creation* New York: Penguin Books

Kozulin, A. (1990) *Vygotsky's Psychology. A biography of ideas*. New York: Harvester Wheatsheaf .

Kuhn, Thomas (1962) *The Structure of Scientific Revolutions* The University of Chicago Press

Newman, D., Griffin, P. & Cole Hillsdale, New Jersey (1989). *The construction zone: Working for cognitive change in school*. Cambridge: Cambridge University Press.

Rosaldo, M.Z. Toward an anthropology of self and feeling, pp. 137-157. In, Shweder, R.A. & LeVine, R.A. (1984, 1997) *Culture Theory*. Cambridge: Cambridge University Press.

Ryle, G. (1949) *The concept of mind*. Chicago: University of Chicago Press

Talyzina, N. (1981) , *The Psychology of Learning*. Moscow: Prospect Publishers.

Tharp, R.G. & Gallimore, R. (1988 ) *Rousing minds to life*. Cambridge, Cambridge University Press.

Vygotsky, L.S. (1978), *Mind in Society: The development of higher psychological processes*.

Wertsch, J.V. (1985), *Vygotsky and the social formation of mind*. Cambridge, Mass. Harvard University Press.